

PUTTING THE “OLOGY” INTO CRYPTOZOOLOGY

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Cryptozoology is sometimes criticised by scientists and skeptics as a pseudoscience (Shermer 1997, Radford & Nickell 2006, Prothero 2007) and for having a weak evidence base (Naish 2000). Paxton (2002) suggested that cryptozoology was not currently a science but was, at its best, a valid form of scholarship, akin to natural history in that it could be a scholarly investigation of the natural world, albeit without experimentation or falsification of hypotheses. Other authors have expressed similar opinions (Arment 2004, Roesch & Moore 2002). Bille (pers. comm.) has argued that many cryptozoological hypotheses are technically falsifiable (i.e. there is a large bipedal ape living in a particular forest) albeit not practically falsifiable because of budgetary constraints.

Since Paxton's (2002) article, a number of peer-reviewed papers on cryptozoological themes have been published. Some of those papers are on what might be called predictive zoological discovery, i.e. pre-discovery, submitting non-physical evidence for the existence (or extension of range in time and space) of a particular species of animal. Often such papers do not self-identify as being cryptozoologically themed (e.g. Jaric et al. 2009, Fitzpatrick et al. 2005, Roberts & Solow 2003, Boyd & Stansfield 1998), although sometimes they do (e.g. Woodley et al 2008). There have also been

peer-reviewed publications that have used molecular genetic techniques to determine the affinities of physical remains of cryptozoological interest (e.g. Coltman & Davis 2005, Pierce et al. 2004, Carr et al. 2002). Meanwhile Paxton's (2002) claim that cryptozoology was not a science was actually undermined by his own (2009) demonstration that some data from cryptozoological reports are actually amenable to rigorous statistical scrutiny, in contrast to some skeptical views of cryptozoology (e.g. Shermer 2003). Paxton (2009) suggested that if available reported cryptozoological accounts can be reasonably assumed to be an unbiased sample of the total reported cryptozoological reports, then inferences can be reached as to the cryptozoological reporting process, albeit not necessarily what was seen.

However there remains a wide gap between the approaches of these papers and those published in the non-peer-reviewed literature. A peer-reviewed paper has, unsurprisingly, to pass through peer review—i.e. a manuscript will be sent to other researchers to read and comment on. If they don't like it, it will be rejected or modifications will be requested. Thus the paper needs to be well written and well reasoned. And for scientists that means very well written and very well reasoned. No, I mean it, really well reasoned. The following tips are to supply guidance to those wanting to publish papers in the mainstream peer-reviewed scholarly literature. They also may provide food for thought for authors wanting to produce informal but nonetheless scientifically rigorous publications too. It is not a general guide but deals with the specific methodological assumptions and techniques that should be employed by authors interested in cryptozoology. It is designed to augment the many points discussed in Chad Arment's *Cryptozoology: Science and Speculation*.

1. Do not assume a cryptid exists—the scientific consensus does not accept this and will reject this as a premise. The author may have compelling personal experience of the cryptid under consideration but this cannot be

used as a premise. (It can, of course, be used as evidence). This does not make scientists bigots, just people who want to have verifiable, objective evidence and work from what is known. There is nothing to stop a paper arguing for the existence of an unknown species but there must be compelling evidence with all alternative explanations for the evidence adequately considered. Evidence is not the same as proof (in a cryptozoological context, a corpse, available for analysis by independent parties) and authors should not confuse the two. Authors should also avoid making themselves hostages to fortune by confessing a personal belief in a particular cryptid in the absence of definitive proof. Scientific papers are not really the place for such comments. At best the readers will regard such a statement as an irrelevance; at worst they will consider such a statement as indicative of, ahem, monstrous subjectivity.

2. Do not assume the identity of what was reported (especially if that presumed identity is one not accepted by the scientific community as a whole, e.g. an extant Mesozoic marine reptile or Oligocene whale). Of course, authors can tentatively reach a conclusion as to identity based on the available evidence. My co-authors and I have published papers on the sea monk described in 1546 (Paxton & Holland 2005) and the monster reported by Hans Egede from 1734 (Paxton et al. 2005) and we reached conclusions as to what might have been seen, but we cannot *know* definitively what was seen. No one ultimately will know, unless the report is exposed as a hoax or a corpse turns up. Language should not be employed that gives the impression the author somehow “knows” without equivocation what was seen or what is out there, even if that is not the intention.
3. Eyewitness testimony is inaccurate, sometimes biased, and sometimes even totally false. The evidence for this

is overwhelming and has been shown again and again in a variety of psychological experiments (e.g. see Loftus 1996 for a review). One cannot discount this. However just because witnesses are inaccurate or even inconsistent does not necessarily mean they are lying.

4. The very fact that the witnesses have reported something unknown to them means they do not know what they have seen, therefore the witnesses are not really in the position to gauge their own accuracy, no matter their confidence in their own abilities. Researchers may have to assume that witnesses are right in their zoological identification or description but we should always be aware that this may not be so. They may not have even identified organs and limbs correctly (e.g. perhaps Paxton et al. 2005, Woodley et al. in press).
5. What is reported is different to what is remembered which is different to what was seen which is different to what was present.
6. It follows from 5, that the raw data of testimony-based cryptozoology is not cryptids, it is not sightings, it is reports. Reports are, of course, a biased sample of sightings which are a biased sample of what was seen. There is evidence to support this contention (see Paxton 2009). Thus reports, alas, tell us first and foremost about the reporting process and only secondarily about “cryptids.”
7. Just because reports are named collectively as coming from the same general location does not necessarily mean they have the same source.
8. Just because reports are named collectively as coming from the same general cryptid, does not necessarily mean they have the same source.
9. Closely associated with point 8, beware of the cryptozoological version of the *interpretatio graeca* or *interpretatio romani*, the Greek and Roman tendency (e.g. in Herodotus’ *The Histories*) to assume that the gods of

foreign non-Indo-European pantheons were analogous to those from the classical pantheon. Likewise crypto-zoologists find affinities between folkloric monsters which may not reflect a real zoological or indeed folkloric connection. Although Occam's razor (i.e. when considering hypotheses of equal explanatory power choose the simplest) is a useful guide, in the case of the hypothesis that a monster has a common source as opposed to two independent origins, we cannot necessarily assume that an animal described in folklore under one name in one language is necessarily the same entity in a different language even if they appear superficially morphologically similar. For example just because someone at some point said that the thing called by the Chinese "*lóng*" is the same as the thing described in western European languages as "dragon," "*draco*" etc., does not make it so.

3–9 can be thought of avoiding *Monster Manual* thinking (Paxton 2010, but see also Woodley 2010 for a different view), that is, the tendency of cryptozoologists to regard analysis of reports/evidence secondary to the (subjective) classification, cataloguing and analysis of putative cryptids. Closely related to this is the dubious practice of allowing preconceptions to affect the interpretations of reports and how they are classified, what Woodley (2008) termed the "Oudemans fallacy."

10. The zoological community as a whole does not use the term "cryptid." That does not mean it should not be used, just that it should be defined.
11. Most zoologists have not heard of Bernard Heuvelmans, Ivan Sanderson, Loren Coleman, or any other crypto-zoological personalities. And even if they do, their opinion carries no weight, evidence does.
12. As Naish (2010, 2000) has argued, be aware of the latest findings in the scientific literature. If it is thought one

class of sea monster reports are based on sightings of plesiosaurs, then make the comparison of what we know of plesiosaurs from the current peer-reviewed palaeontological literature today, not of their status in the twentieth century from coffee-table picture books. Failure to consider existing knowledge will cause a paper to be rejected.

13. Wherever possible quantify. Systematic quantification decreases the probability of subjectivity and bias (Schick & Vaughan 2002).
14. Give the wider relevance of why the research is interesting in addition to the fact it might be evidence of an unknown species (i.e. implications for eyewitness psychology, ecology of predators, palaeontology etc.).
15. In addition to not assuming a cryptid exists (see rule 1), do not premise a paper on any assumption that is not accepted by the general scientific community without some evidence to support it. This does not mean non-consensual assumptions cannot be made but that if such an assumption is made, it should be justified by reference to evidence. For example, if an author believes that certain bipedal tracks are made by an extant prehistoric animal that palaeontologists generally assume is quadrupedal, then some evidence for the presumed animal's bipedality, *independent* of the tracks, should be given.
16. The limited evidence there is (Paxton 2009), suggests that first-hand cryptozoological reports are less exaggerated than second-hand reports.
17. The limited evidence there is (Paxton 2009), suggests that anonymous cryptozoological reports are more exaggerated than reports from a named source.
18. Be aware of sampling biases. Reports are biased in a variety of ways, some of which we can predict, some of which are unknown. If monsters are primarily reported on summer days, does this mean they are more active in the summer or that there are more people to report

them? Likewise if sea monsters are primarily seen in calm weather, does this reflect a preference for clement weather or greater detection in flat calm conditions? In fact we know from marine animal survey data that cetaceans for example are much easier to detect under good conditions (e.g. fin whales from ships: Víkingsson et al. 2009). Likewise if there are historical trends in numbers of sea monster reports, one hypothesis that has to be considered is whether there are more/less people to report them. We also know in the case of marine monster reports, the data appears to be biased in that reported distances are closer than might be expected by chance alone (Paxton 2009).

19. By extension from 19, raw quantification of reports *cannot* be used to infer trends or geographic distributions or habitat preferences in the absence of some measure of search effort except in very, very, crude terms (e.g. if reports only came from mountains where few people live then it would be reasonable, *if* the reports can be assumed to come from a common source animal, to assume the animal genuinely occurred only in the mountains). Just as in any scientific animal survey, what is reported is a function not only of what is there to be seen but the effort used to hunt for it. Typically we don't know the search effort (e.g. the number of man-hours available to observe cryptids). Anecdotal reports can be considered to be a special class of what is referred by some ecologists as "presence-only" data.* Inferring habitat preferences from presence-only data can cause substantial bias (Paxton & Donovan in preparation).

*A bias caused by using the equivalent of presence-only data, was strongly implicated in the decision to launch the space shuttle *Challenger* under unfavourable environmental conditions leading ultimately to its destruction (Dawes 2001).

This point, alas, is more than occasionally missed in mainstream ecology papers written by people who really should know better.

Neglect of search effort can be seen as a special case of what is sometimes referred to in the critical thinking literature as “ratio biases,” the tendency of humans to evaluate ratios/fractions inappropriately (e.g. Reyna & Brainerd 2008), although in this case the problem is a failure to recognise that a fraction should be used at all.

If search effort is measured, not reporting a cryptid can be just as informative as reporting a cryptid, at least with regard to indicating potential habitat preferences. Fortunately, with the increasing availability of motion-activated wildlife cameras, encounter per unit effort data should be available to terrestrial cryptozoologists in remote locations.

It should be noted that whilst encounter/report etc. per unit effort is better than quantifying raw reports/encounters if evaluating habitat preferences etc., even per unit effort data may have problems. It is well known from the fisheries literature where catch per unit effort (CPUE) is a commonly used statistic, that sometimes even CPUE does not relate consistently to abundance (e.g. Jennings et al. 2001).

It is not just the effort of cryptozoologists directly that needs to be considered, reporting effort, that is the effort used in soliciting and collecting reports, similarly needs to be quantified. Cryptid flaps could be a function of increased cryptid activity/numbers, or more witnesses arriving to try to see the monster, but above all, of course, witnesses being more likely to consider reporting a strange encounter and the effort/interest of reporters in tackling the stories.

20. Detectability of animals is a major undiscussed issue in the search for unknown species but there is a large statistical literature on this topic (e.g. Buckland et al.

2001). Whether a species is known or unknown will be a function of the individual animal detectability (assuming people are in the right habitat), the size of the population, and the search effort in the right habitat.

21. There is evidence that both temporal and spatial trends in anomalous event reports may reflect culture rather than what was actually seen (e.g. *ghosts*: Davies 2007, Finucane 1996; *Bigfoot*: Regal 2010; *aquatic monsters*: Meurger & Gagnon 1988, Magin 1996). Thus a change in frequency of reports of one type (in the unlikely event “types” can readily be objectively identified, see Paxton 2010 and above), may not reflect a change in biology. Cryptozoologists should not ignore this.
22. The conclusions must derive from the evidence presented in the paper and the reader should be able to easily follow the argument from data/evidence to conclusion.
23. Follow the journal conventions in writing the paper.
24. Every point made *must* be justified either through evidence supplied within the paper or by reference to existing published literature. Assertion in the absence of evidence is not acceptable in peer-reviewed papers. References used should be scholarly where possible and definitely from print media or an online equivalent. Ephemeral references (websites etc.) should not be used, save as an absolute last resort. Blogs and the like are generally unacceptable as sources in formal papers. *Wikipedia* is completely unacceptable; it can be written by 12-year-olds. Getting good quality references is hard work but it is an essential part of the compilation of a scientific paper.
25. A good scientist is always honest about potential weaknesses/gaps in his assumptions, data, reasoning, or conclusions. Better the author exposes problems than the editors or referees!
26. Professional scientists may be more happy to collaborate (e.g. Crother et al. 2009) than cryptozoologists

might expect, but only if no unjustified conclusions are being made. Therefore it is worth thinking about contacting a professional scientific co-author who can help in the research and writing up. Indeed, professional zoologists may use the expertise of amateurs to contribute to their endeavours (e.g. Paxton et al. 2005). I would hope that the presence of an author from a recognised “institution” on the author list would not alter the probability of acceptance of the paper one jot, but, alas, this may not be the case, thus giving a further reason for such collaboration. One catch is that many scientists have to justify their time and so any cryptozoological work may have to be undertaken in their free time and they may not have access to resources for expensive laboratory work in what is not their core role.

27. Think hard about the appropriate journal for the material under consideration. The description of a *bona fide* Bigfoot, with the corpse deposited in a publicly accessible museum (an essential step), really should go to *Nature* or *Science*, the pre-eminent science journals in the world. Most papers will not have that impact! Interpretation of folklore/ethnoknowledge should go to a folklore or perhaps anthropology journal. Interpretation of historical accounts should go perhaps to a history of science journal. Statistical analysis of eyewitness accounts could go to general zoology journals or, depending on emphasis, psychological journals. Identification of corpses/analyses of biological material by molecular genetics means can be published in genetics journals. There is also the *Journal of Scientific Exploration*, which will take cryptozoological material, as well as the dedicated cryptozoology journal *Kraken*.
28. A paper may well be rejected. This may be because it is fundamentally flawed, badly written, or the authors were just unlucky with the review process and the reviewers. If you don't think it is fundamentally flawed,

then consider submitting it to another journal. Do not engage in a battle with the editor—that is ungentlemanly, and is guaranteed not to be productive. If you do submit to another journal, do take into account the reviewers' remarks. I have had papers rejected, sometimes unfairly in my view, but the reviewers' remarks have always proved in whole or part useful in improving the manuscript. Only once (in six submissions of material to journals) have I encountered behaviour that might be suggestive of an unfair prejudice against cryptozoological data. Otherwise editors have been happy to consider my manuscripts.

29. Remember, cryptozoology is a controversial subject, which means that cryptozoological manuscripts will receive more than the usual critical scrutiny. This possibly means that a cryptozoological paper really will need to be better than the average mainstream paper to get published.

One final seemingly self-evident point should be made. Papers must be submitted in order to be considered for publication! Cryptozoologists cannot complain about scientists ignoring their work if they don't actually submit said work for scientific consideration. So start writing!

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